



EXPERIMENTAL UNMANNED VEHICLES

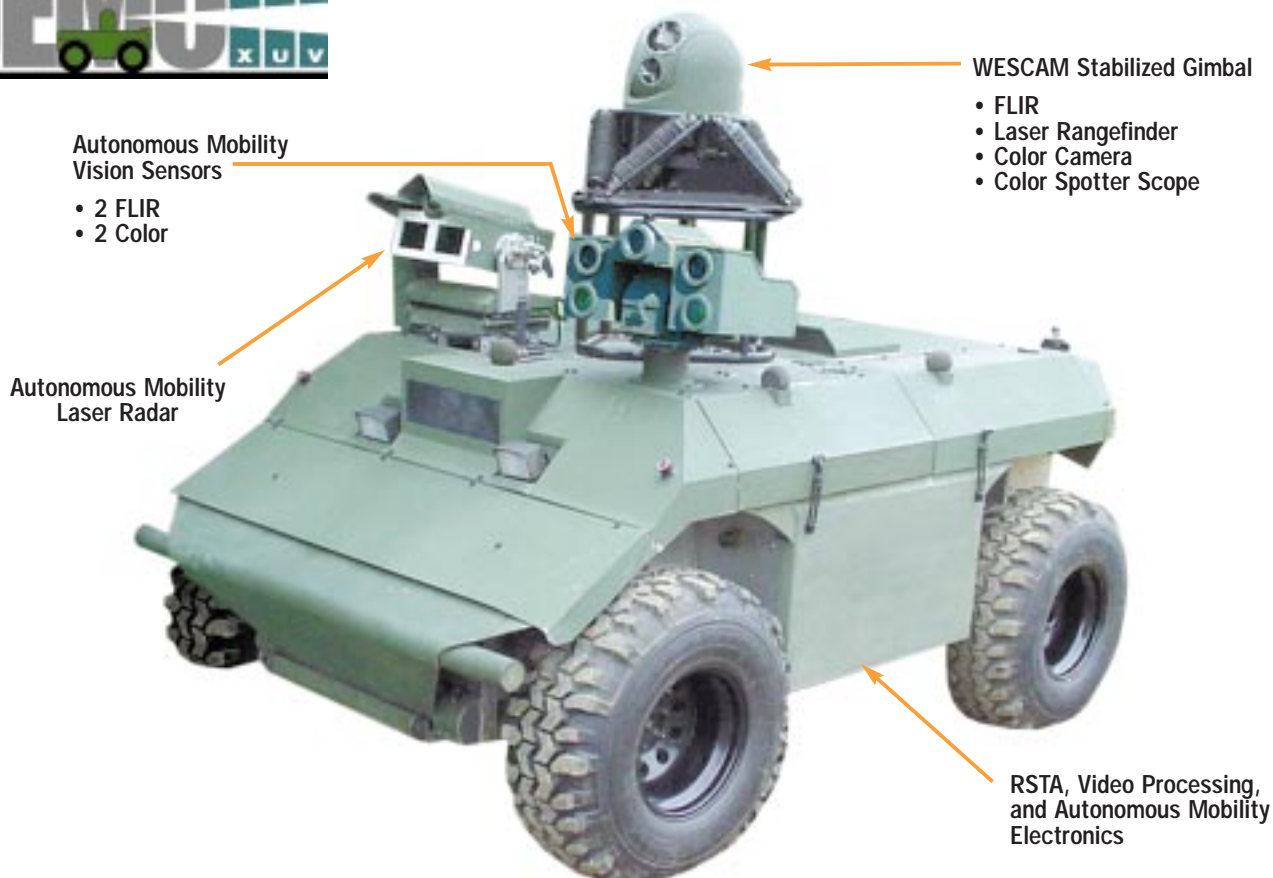
Robotics is a key enabling technology for future military operations. Its application will enable U.S. military forces to dominate future conflicts at currently projected force structures and reduced friendly casualties. Small, lightweight, highly mobile robots will allow revolutionary operational paradigms to be employed—deep insertion behind enemy lines to detect and interdict the enemy with minimal risk to friendly forces, employment in hazardous environments to reduce vulnerability to mines and chemical/biological agents, and one-soldier supervision of multiple semi-autonomous systems to increase force effectiveness. Since 1990, the U.S. Army Research Laboratory (ARL), with support from the DoD Joint Robotics Program, has been conducting the Army Ground Robotics Research Program to develop and demonstrate technology required to field future ground-mobile robotic systems. The Demo III Program, initiated in 1997, is the current focal point of this effort.

The primary goal of Demo III is to develop autonomous-mobility technology to enable an unmanned ground vehicle (UGV) to tactically maneuver over rugged terrain as an integral part of a mixed force of manned and unmanned vehicles. Implicit in this goal are the requirements for the UGV to maneuver at speeds comparable to manned vehicles, employ appropriate tactical skills and behaviors, function reliably without requiring additional specialized personnel, and couple intuitive operator-friendly man/machine interfaces with existent command-and-control systems. Demo III is utilizing the scout mission to define the set of autonomous tasks and behaviors to be employed by the experimental unmanned vehicles (XUVs) during experimentation and demonstration. These include the use of terrain and other environmental conditions to provide cover and concealment, the extensive cross-country navigation through unknown environments, and the provision of detailed reconnaissance information concerning both terrain and opposing forces. Many of the behaviors required to conduct the scout mission are directly applicable to other military missions.



Unmanned Ground Vehicles will provide force multipliers—with minimal operator burden—that can be applied to a variety of military missions, including scout reconnaissance, urban warfare, and evacuation of casualties from the field.





Experimental Unmanned Vehicle (XUV)

Ultimately, successful application of UGVs to military missions will require the insertion of mobility, perception, real-time control software, and intelligent architecture technologies. Autonomous day/night, cross-country mobility requires the detection and negotiation or avoidance of various obstacles under a wide range of environmental conditions. In addition to fairly large obstacles, such as rocks extending upward from the ground plane, consideration must be given to obstacles below the ground plane, such as streams and gullies. Other obstacles, such as trees and impenetrable vegetation, concertina wire, and objects hidden by grass, must also be considered. Perception must ultimately extend beyond detection to classification and identification of a large object set within an unstructured environment. UGVs must possess significant intelligence to maneuver independently, without direct operator control. However, as part of a larger military force, their missions and goals will be clearly defined and dynamically altered by a commander or operator, as the tactical environment changes and if intervention is required to assist the UGVs in situations too complex for an on-board solution.

The Demo III Program is following a spiral development model that features multiple cycles of design, simulation, experimentation, and evaluation. The program consists of three parallel thrusts: (1) technology development, conducted by numerous research laboratories and led by ARL, (2) modeling, simulation, and experimentation, a highly leveraged effort involving numerous laboratories and agencies and led by ARL, and (3) technology integration and demonstration, conducted by a contractor team led by General Dynamics Robotic Systems. A well-defined set of periodic, incremental milestones—focused on annual field exercises with troops—fosters coordination among the program components and provides opportunities for demonstration of capabilities and feedback from the user community. Active participation from the U.S. Army Materiel Command's research, development, and engineering centers and the Joint Program Office for Unmanned Ground Vehicles and Systems will help to insure a smooth transition of the technologies developed and demonstrated in Demo III to future Army acquisition programs.

FOR FURTHER INFORMATION

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